

Amendments To The Claims

1-52. (Cancelled)

53. (New) A method of detecting an ion in a sample, comprising:
contacting a nucleic acid enzyme with a sample suspected of containing
the ion, to produce a product; and

measuring an amount of the product produced;
wherein the ion is in the presence of other ions,
the enzyme is dependent on the ion to produce the product from a
substrate, and

the substrate comprises a fluorophore and the enzyme comprises a
quencher of the fluorophore, or the enzyme comprises a fluorophore and the substrate
comprises a quencher of the fluorophore.

54. (New) The method of claim 53, wherein the nucleic acid enzyme
comprises a ribozyme.

55. (New) The method of claim 53, wherein the nucleic acid enzyme
comprises a deoxyribozyme.

56. (New) The method of claim 53, wherein the nucleic acid enzyme and the
substrate comprise separate nucleic acid strands.

57. (New) The method of claim 53, wherein the enzyme is linked to a support.

58. (New) The method of claim 53, wherein the substrate comprises at least
one ribonucleotide.

59. (New) The method of claim 55, wherein the deoxyribozyme comprises a
single strand.

60. (New) The method of claim 53, wherein the ion is a divalent cation.

61. (New) The method of claim 60, wherein the divalent cation is selected from the group consisting of Mg^{2+} , Ca^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Zn^{2+} , Cd^{2+} , Cu^{2+} , Pb^{2+} , Hg^{2+} , Pt^{2+} , Ra^{2+} , Ba^{2+} and Sr^{2+} .

62. (New) The method of claim 53, wherein an array of nucleic acid enzymes comprises the nucleic acid enzyme.

63. (New) A method of detecting an ion in a sample, comprising:
contacting a nucleic acid enzyme with a sample suspected of containing the ion, to produce a product; and
measuring an amount of the product produced by fluorescence;
wherein the ion is in the presence of other ions, and
the enzyme is dependent on the ion to produce the product from a substrate.

64. (New) The method of claim 63, wherein the nucleic acid enzyme comprises a ribozyme.

65. (New) The method of claim 63, wherein the nucleic acid enzyme comprises a deoxyribozyme.

66. (New) The method of claim 63, wherein the nucleic acid enzyme and the substrate comprise separate nucleic acid strands.

67. (New) The method of claim 63, wherein the enzyme is linked to a support.

68. (New) The method of claim 63, wherein the substrate comprises at least one ribonucleotide.

69. (New) The method of claim 65, wherein the deoxyribozyme comprises a single strand.

70. (New) The method of claim 63, wherein the ion is a divalent cation.

71. (New) The method of claim 70, wherein the divalent cation is selected from the group consisting of Mg^{2+} , Ca^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Zn^{2+} , Cd^{2+} , Cu^{2+} , Pb^{2+} , Hg^{2+} , Pt^{2+} , Ra^{2+} , Ba^{2+} and Sr^{2+} .

72. (New) The method of claim 63, wherein an array of nucleic acid enzymes comprises the nucleic acid enzyme.

73. (New) The method of claim 63, wherein the ion is Pb^{2+} .

74. (New) A method of detecting an ion in a sample, comprising:
contacting a nucleic acid enzyme with a sample suspected of containing the ion, to produce a product; and
measuring an amount of the product produced;
wherein the ion is in the presence of other ions and the ion is a divalent cation, and
the enzyme is dependent on the ion to produce the product from a substrate.

75. (New) The method of claim 74, wherein the nucleic acid enzyme comprises a ribozyme.

76. (New) The method of claim 74, wherein the nucleic acid enzyme comprises a deoxyribozyme.

77. (New) The method of claim 74, wherein the nucleic acid enzyme and the substrate comprise separate nucleic acid strands.

78. (New) The method of claim 74, wherein the enzyme is linked to a support.

79. (New) The method of claim 74, wherein the substrate comprises at least one ribonucleotide.

80. (New) The method of claim 76, wherein the deoxyribozyme comprises a single strand.

81. (New) The method of claim 74, wherein the divalent cation is selected from the group consisting of Mg^{2+} , Ca^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Zn^{2+} , Cd^{2+} , Cu^{2+} , Pb^{2+} , Hg^{2+} , Pt^{2+} , Ra^{2+} , Ba^{2+} and Sr^{2+} .

82. (New) The method of claim 74 wherein an array of nucleic acid enzymes comprises the nucleic acid enzyme.

83. (New) The method of claim 74, wherein the ion is Pb^{2+} .

84. (New) A composition for detecting an ion in a sample, comprising:

a nucleic acid enzyme,

a substrate,

a fluorophore, and

a quencher of the fluorophore,

wherein the enzyme is dependent on an ion to produce a product from the substrate, and

the substrate comprises the fluorophore and the enzyme comprises the quencher of the fluorophore, or the enzyme comprises the fluorophore and the substrate comprises the quencher of the fluorophore.

85. (New) The composition of claim 84, wherein the nucleic acid enzyme comprises a ribozyme.

86. (New) The composition of claim 84, wherein the nucleic acid enzyme comprises a deoxyribozyme.

87. (New) The composition of claim 84, wherein the nucleic acid enzyme and the substrate comprise separate nucleic acid strands.

88. (New) The composition of claim 84, further comprising a support linked to the enzyme.

89. (New) The composition of claim 84, wherein the substrate comprises at least one ribonucleotide.

90. (New) The composition of claim 86, wherein the deoxyribozyme comprises a single strand.

91. (New) The composition of claim 84, wherein the ion is a divalent cation.

92. (New) The composition of claim 84, wherein the divalent cation is selected from the group consisting of Mg^{2+} , Ca^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Zn^{2+} , Cd^{2+} , Cu^{2+} , Pb^{2+} , Hg^{2+} , Pt^{2+} , Ra^{2+} , Ba^{2+} and Sr^{2+} .

93. (New) The composition of claim 84, wherein an array of nucleic acid enzymes comprises the nucleic acid enzyme.

94. (New) The composition of claim 84, wherein the ion is Pb^{2+} .

95. (New) A method of detecting the presence of an ion, comprising:

(a) contacting a nucleic acid enzyme, wherein the enzyme is dependent on the ion to produce a product from a substrate, with a sample suspected of containing the ion; and

(b) measuring an amount of the product produced;
wherein the ion is in the presence of other ions, and the ion is Pb^{2+} ;
wherein the substrate comprises a fluorophore and the enzyme comprises a quencher of the fluorophore, or the enzyme comprises a fluorophore and the substrate comprises a quencher of the fluorophore.

96. (New) The method of claim 95, wherein the nucleic acid enzyme comprises a ribozyme.

97. (New) The method of claim 95, wherein the nucleic acid enzyme comprises a deoxyribozyme.

98. (New) The method of claim 95, wherein the nucleic acid enzyme and the substrate comprise separate nucleic acid strands.

99. (New) The method of claim 98, wherein a 5'-end of the substrate comprises the fluorophore.

100. (New) The method of claim 98, wherein a 3'-end of the enzyme comprises the quencher for the fluorophore.

101. (New) The method of claim 98, wherein the fluorophore is TAMRA.

102. (New) The method of claim 101, wherein the quencher is DABCYL.

103. (New) The method of claim 98, wherein the enzyme is linked to a support.

104. (New) The method of claim 98, wherein the substrate comprises at least one ribonucleotide.

105. (New) The method of claim 98, wherein the substrate comprises the nucleic acid sequence of SEQ ID NO:2.

106. (New) The method of claim 98, wherein the enzyme comprises the nucleic-acid sequence of SEQ ID NO:1.

107. (New) The method of claim 97, wherein the deoxyribozyme comprises a single strand.

108. (New) The method of claim 107, wherein the single strand comprises the fluorophore.

109. (New) The method of claim 108, wherein the single strand further comprises the quencher for the fluorophore.

110. (New) The method of claim 107, wherein the single strand comprises the nucleic acid sequence of SEQ ID NO:1.

111. (New) The method of claim 110, wherein the single strand further comprises the nucleic acid sequence of SEQ ID NO: 2.

112. (New) The method of claim 95, wherein the product comprises a nucleic acid.

113. (New) The method of claim 112, wherein the nucleic acid comprises the fluorophore.

114. (New) The method of claim 112, wherein the nucleic acid comprises the fluorophore quencher.

115. (New) The method of claim 95, wherein the sample suspected of containing the ion comprises a water sample.

116. (New) The method of claim 95, wherein the sample suspected of containing the ion comprises a bodily fluid.

117. (New) The method of claim 116, wherein the bodily fluid is blood.

118. (New) The method of claim 95, wherein the measuring comprises a measurement of fluorescence.

119. (New) The method of claim 118, wherein the measurement of fluorescence is selected from the group consisting of fluorescence intensity, fluorescence lifetime, and anisotropy.

120. (New) The method of claim 119, wherein an increase in fluorescence is indicative of the presence of the ion.

121. (New) The method of claim 95, wherein an array of nucleic acid enzymes comprises the nucleic acid enzyme.

122. (New) A method of determining the concentration of an ion in a sample, comprising:

(a) contacting a nucleic acid enzyme, wherein the enzyme is dependent on the ion to produce a product from a substrate, with the sample containing an unknown concentration of the ion;

(b) measuring an amount of the product produced; and

(c) comparing the measurement obtained in (b) with that of a standard curve created using known concentrations of the ion;

wherein the ion is in the presence of other ions; the ion is Pb²⁺; and
wherein the substrate comprises a fluorophore and the enzyme comprises
a quencher of the fluorophore, or the enzyme comprises a fluorophore and the
substrate comprises a quencher of the fluorophore.

123. (New) The method of claim 122, wherein the nucleic acid enzyme
comprises a ribozyme.

124. (New) The method of claim 122, wherein the nucleic acid enzyme
comprises a deoxyribozyme.

125. (New) The method of claim 122, wherein the nucleic acid enzyme and the
substrate comprise separate nucleic acid strands.

126. (New) The method of claim 125, wherein a 5'-end of the substrate
comprises the fluorophore.

127. (New) The method of claim 126, wherein a 3'-end of the enzyme
comprises the quencher for the fluorophore.

128. (New) The method of claim 125, wherein the fluorophore is TAMRA.

129. (New) The method of claim 128, wherein the quencher is DABCYL.

130. (New) The method of claim 125, wherein the enzyme is linked to a
support.

131. (New) The method of claim 125, wherein the substrate comprises the
nucleic acid sequence of SEQ ID NO:2.

132. (New) The method of claim 125, wherein the enzyme comprises the
nucleic acid sequence of SEQ ID NO:1.

133. (New) The method of claim 124, wherein the deoxyribozyme comprises a
single strand.

134. (New) The method of claim 133, wherein the single strand comprises the fluorophore.

135. (New) The method of claim 122, wherein the product comprises a nucleic acid.

136. (New) The method of claim 135, wherein the nucleic acid comprises the fluorophore.

137. (New) The method of claim 135, wherein the nucleic acid comprises the fluorophore quencher.

138. (New) The method of claim 122, the sample suspected of containing the ion comprises a water sample.

139. (New) The method of claim 122, wherein the sample suspected of containing the ion comprises a bodily fluid.